AL-Fateh University Faculty of Engineering Electrical and Electronic Department
Fall 2010 – 2nd Midterm Exam Solution **Signals & Systems (EE302)**
Instructors: Dr. A. Ganoun & Dr. W. Abughres

==

Q1 $$y(t) = \int_{\tau=a}^{t} \left(\frac{\tau}{t}\right) \cdot X(\tau)\, d\tau \quad \text{--->} \quad y(t)_1 = \int_{\tau=a}^{t} \left(\frac{\tau}{t}\right) \cdot X(\tau - t_o)\, d\tau$$

$$U := \tau - t_o \qquad d\tau = du \quad \text{------>} \quad y(t)_1 = \int_{u=a-t_o}^{u=t-t_o} \left(\frac{u + t_o}{t}\right) \cdot X(u)\, du$$

which is not equal to y(t-to)--------> time varying

$$x(t) = ax_1(t) + bx_2(t) \quad \rightarrow \quad y(t) = ay_1(t) + by_2(t)$$

The system is linear & time varying

Q2) a)

$$H(j\omega) = \frac{5}{(j\omega)^2 + 2(j\omega) - 2}$$

b)

$$y^h(t) = c_1 e^{r_1 t} + c_2 e^{r_2 t} \qquad r_1 = -2.7321, \quad r_2 = 0.7321 \qquad y^p(t) = 5e^{-3t}$$

$$y(t) = y^h(t) + y^p(t) = -5.1753e^{r_1 t} + 1.753e^{r_2 t} + 5e^{-3t} \qquad t \geq 0$$

Q3)

$$H(s) = \frac{6(s+34)}{s\left(s^2 + 10s + 34\right)} = \frac{6}{s} - \frac{3-4i}{s+5-3i} - \frac{3+4i}{s+5+3i}$$

$$k = -3 - 4i = 5\angle -126.869$$

$$f(t) = \left[6 + 2\,|\,5\,|\,e^{-5t}\cos(3t + 126.9)\right]u(t)$$

or

$$H(s) = \frac{6(s+34)}{s\left(s^2 + 10s + 34\right)} = \frac{6}{s} - \frac{6(s+5)}{(s+5)^2 + 9} - \frac{8(3)}{(s+5)^2 + 9}$$

$$f(t) = \left[6 - 6e^{-5t}\cos(3t) - 8e^{-5t}\sin(3t)\right]u(t)$$

Q4)

$$y(t) = x(t) * h(t)$$

